

a solid base 4, can vary in geometric shape to accommodate various toilet models and can be either open or closed at its top.

Said functional operating components located inside said submergible housing 2 consist of the following: A cleaning fluid pump 5 connected to a cleaning fluid pressure release valve 6, a means to pipe 11 said cleaning fluid to an externally located cleaning nozzle 7, and an electrical heater 8 that heats said cleaning fluid to a temperature ranging from 25°C to 50°C. Also residing inside said submergible housing 2 is an electrical power 21 and a control wire connection 9 to said cleaning fluid pump 5 to and said electrical heater 8. A pressure sensitive switch installed under the toilet seat is used to prevent pump activation without the weight of a person sitting on the toilet. Said cleaning fluid pump 5 operates at a cleaning fluid pumping rate of 10 to 50 milliliters per second.

The operating duration of said cleaning fluid pump 5 is a) controlled by the user by means of an on/off switch 10 or b) set within the apparatus. The fluid rate is set by means of a mechanical or electrical controller within the said rate boundaries either set by the user during the use or set as a constant within the pump itself. The cleaning fluid temperature is set at the heater by controlling the rate of electrical power consumption or cleaning fluid temperature using either open loop or closed loop controllers.

A fluid pressure release valve 6, residing within the submergible housing 2, evacuates the cleaning fluid resident within the section from cleaning fluid pump 5 to cleaning nozzle 7 while providing three important functions. First, such valve interrupts the siphoning flow of the cleaning fluid after deactivating the cleaning fluid pump 5. Second, such valve provides a low level cleaning function for the contaminated cleaning nozzle 7. Third, such valve prevents cold cleaning fluid from being present at the beginning of next cleaning cycle.

A means, which pipes 11 cleaning fluid from the cleaning fluid pump 5 to a replaceable cleaning nozzle 7 mounted within the confines of a conventional toilet bowl 12, accommodates the cleaning fluid flow rates and cleaning fluid pressures and routes the cleaning fluid to the point of use, the cleaning nozzle 7. Said means to pipe 11 cleaning fluid is particularly configured for ease of installation and reliable operation.

Said cleaning nozzle 7 is mounted within the confines of a conventional toilet bowl 12 along its longitudinal axis at the back end of the toilet bowl 12 and below the rim of said toilet bowl 12. Said cleaning nozzle 7 is positioned within a well defined area defined by horizontal tolerance ranging from 30 to 150 millimeters below the rim of said toilet bowl 12 and vertical tolerance bound by plus/minus 80 millimeters from said longitudinal center line. Said cleaning nozzle 7 is mounted within 0 to 50 millimeters of the inner wall at the back end below the rim of said toilet bowl 12. Said nozzle is positioned in an upward angle that is defined by a projected cleaning space 13 and bound by an area created by the inside rim of said toilet bowl 12.

Said cleaning nozzle 7 creates a single diffused stream 14 of cleaning fluid directed toward said projected cleaning space 13 located within the confines of said toilet bowl 12; where, said projected cleaning space 13 is parallel to the area projected by the inside corner of the upper rim 15 of said toilet bowl 12, and said projected cleaning space 13 is centered in the rear half 27 of the toilet bowl 12 along the longitudinal center line 28 and segmented by the latitudinal center line 29 of the toilet bowl 12. Said projected cleaning space 13 is singular in any geometric shape 30 fitting within the confines of an oval 31, centered in the rear half along the longitudinal axis of any conventional toilet bowl 12, wherein said oval is bound in the rear end of the toilet bowl 12 by the toilet bowl 12 rim. The maximum width of said boundary projected cleaning space 13 oval is 150 millimeters while its maximum length is 200 millimeters.

Another variation of the said cleaning nozzle 7 is a specific cleaning cycle for the cleaning nozzle 7 itself. This cycle is achieved by piping and depositing a disinfectant and deodorizer 16 onto the outer nozzle's surfaces 23 after every use to ensure sanitary conditions for the subsequent user. This cleaning process is achieved through the use of a parallel piping conduit 22 that terminates at the upper end of the nozzle mount in a manner that assures complete coverage of the outer nozzle's surfaces 23. The cleaning agent is located at the originating end of said conduit. A control circuit 24 automatically dispenses said cleaning agent after the nozzle is disengaged by the user. Readily commercially available toilet cleaning agents, such as DOW disinfectant bathroom cleaner, can be used as a cleaning agent for this purpose. The combination of a self-cleaning nozzle 7 and a disinfectant and deodorizer 16 will assure complete sanitary operation for every user.

Another embodiment of said cleaning nozzle 7 is one that creates a plurality of diffusing streams of cleaning fluid toward said projected cleaning space 13 of the various preferred geometric shapes.

A key feature of this invention is the definition of a set of process conditions for the various apparatuses. It is deemed very important to have said cleaning fluid expelled by said cleaning nozzle 7 at a specific flow rate and specific temperature. The preferred range of said cleaning fluid flow is from 10 to 50 milliliters per second at a temperature range from 25°C to 50 °C. The specific set point of both parameters are selected and set by the user according to personal preference. The apparatus has the capability of controlling both the flow rate and the temperature within reasonable tolerance limits.

Said cleaning fluid can consist of water only, water mixed with soap 17, water mixed with anti-bactericide 18, water mixed with anti-smelling agents 19 and any combination thereof. Those additives are added via injectors 20 in liquid form or slowly released into the cleaning water in solid form, or any other known method of adding water soluble components to said cleaning fluid.

The second preferred embodiment is one that uses an external cold water supply 25 and an external housing 26 containing a pump 5, a heater 8, an anti-siphon valve 6,

an electrical power source 21, a control wiring 21, and sufficient free volume to hold cleaning fluid. Aside from the housing being external to a conventional toilet 12, this embodiment contains all the functionality described in the above detail description of the first embodiment of this invention. It is different from the first embodiment in that it does not require a said communicating fluid entry opening 3 within its housing, however, does require insulation 26 around its body to minimize power use. The said external housing 26 can be either foot mounted or wall mounted to fit the special requirements of its users. The external housing 26 embodiment is particularly well suited for high frequency use installations; the cleaning fluid storage volume and its internal components, such as the cleaning fluid pump 5 and the cleaning fluid heater, can be sized to fit virtually all needs from extremely high usage at public facilities to low usage private use facilities. The routing of cleaning fluid from the external housing 26 to the toilet bowl 12, its installation, the location of its replaceable cleaning nozzle 7, and its use are identical to the description provided for the first embodiment. This device can be installed into a boat in an environmentally friendly manner.

The third preferred embodiment is one that uses an external cold water supply 25, pressure and flow regulator 32 and a pressurized heating chamber 33 containing a heater 8, an electrical power source 21, a control wiring 9, and sufficient free volume to hold cleaning fluid. ~~Aside from the housing being external to a conventional toilet 12.~~ This embodiment contains all the functionality described in the above detail description of the first embodiment of this invention. It is different from the first embodiment in that it does not require a said communicating fluid entry opening 3 within its housing, however, does require minimal insulation 26 around its body to minimize power use. ~~The said pressurized heating chamber 33 can be either foot mounted or wall mounted to fit the special requirements of its users.~~ The preferred embodiment uses an encapsulating housing for the above listed components in a configuration mountable to virtually any conventional toilet. Said encapsulating housing provides structure, esthetics and function for the various configurations implicit in this invention. Its design permits easy installation of the components arranged in the encapsulating housing via typically available two bolt toilet seat and lid mounts. The design can incorporate a replacement toilet seat and lid. Said encapsulating housing can be of materials that inhibit the growth of bacteria, thus improving its sanitary operating conditions. Said encapsulating housing is designed such that it incorporates sufficient thermal insulating properties to achieve acceptable thermal energy losses. One of the nozzle movement configurations utilizes the cleaning fluid line pressure to facilitate said movement, while achieving nozzle cleaning at the same time. The compact design allows addition of cleaning fluid additives via cartridges 17, 18, and 19. Furthermore, such design can house a means to provide an air drying function via a heater, blower and plenum chamber distribution. An additional optional feature for the air drying function is the incorporation of air freshener cartridges. This embodiment can, as an additional option, house a second cleaning nozzle that is operated independently from the first nozzle 7 for the purpose of providing a bidet function. Maintaining sanitary and clean conditions of the apparatus is of paramount importance. One of the features to support this issue as part of the overall solution is the addition of a hose sprayer that

can be conveniently operated to clean the apparatus. Said hand sprayer is provided either as an integral part of the encapsulating housing or as an add-on via quick disconnect adapter. Another component of the apparatus cleanliness solution is to direct a small portion of the cleaning fluid flow via small outlets toward the cleaning nozzle during the apparatus use facilitating removal of fecal matter from most exposed surfaces. Utilizing cleaning fluid pressure to move the nozzle assembly into its operating position achieves a mechanical cleaning of exposed surfaces during both movements of said assembly. The design of the nozzle and supporting rod is such that virtually all exposed surfaces of this component are exposed to the mechanical cleaning process, thus, a clean nozzle moves into its operating position every time. Furthermore, the retracted rod and nozzle assembly are surrounded by cleaning fluid containing antibacterial agents and other optional additives in its rest position, thus adding incrementally to the overall sanitary operation of this invention. Another optional feature is the addition of a post use apparatus cleaning cycle wherein most exposed and soiled surfaces are treated with cleaning fluid after every use. Said post use apparatus cleaning cycle directs cleaning fluid, enhanced by a cleaning agent provided by an apparatus resident cartridge, toward soiled apparatus and toilet surfaces.

The pressurized heating chamber 33 embodiment is particularly well suited for high frequency use installations; the cleaning fluid storage volume and the cleaning fluid heater can be sized to fit virtually all needs from extremely high usage at public facilities requiring cleaning fluid storage volume up to 5,000 cubic centimeters, to low usage private use facilities requiring cleaning fluid storage volume from 200 to 1,000 cubic centimeters. The routing of cleaning fluid from the pressurized heating chamber 33 to the toilet bowl 12, its installation, the location of its replaceable cleaning nozzle 7, and its use, are identical to the description provided for the first embodiment with the exception of a flow control valve 34, a nozzle position control device 35, and a nozzle push-in connector 36. This device can as well be installed into boats or other recreational vehicles in an environmentally friendly manner.

While the present invention is described with reference to the preferred embodiments, it is in no way the intention to limit the invention to those embodiments but rather to include all modification, alterations and equivalent possible arrangements within the scope of the appended claims.